



PATENT
Attorney Docket: 1094-32

THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT(S): Hildreth et al.

GROUP: 1764

SERIAL NO.: 10/660,065

EXAMINER: Thuan D. Dang

FILED: September 8, 2003

DATED: January 18, 2007

FOR: PROCESS FOR THE PRODUCTION OF ETHYLBENZENE FROM DILUTE
ETHYLENE STREAMS

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313

PETITION UNDER 37 CFR 1.143 and 1.144

Sir:

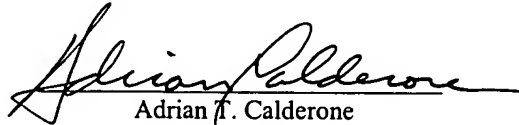
This is a petition for review and withdrawal of a restriction requirement issued in the
above identified application.

On May 9, 2006, Applicants herein mailed an Amendment to the U.S. Patent and
Trademark Office in response to the Office Action of February 13, 2006 issued in this
application. The Amendment included the addition of new Claims 19 to 23 of which claims 19
and 21 were independent. Claims 20¹, 22 and 23 are dependent claims.

Certification under 37 C.F.R. §1.8

I hereby certify that this correspondence is being deposited with the United States Postal Service as first
class mail, postpaid in an envelope, addressed to: Mail Stop: Amendment, Commissioner for Patents, PO Box 1450,
Alexandria VA 22313-1450, on January 18, 2007.

Dated: January 18, 2007


Adrian T. Calderone

¹ Claim 20 erroneously recites depending from Claim 17 due to a typographical error. Claim 20 should depend from Claim 19.

A list of all of the pending claims is appended hereto in Exhibit 1.

On July 24, 2006, Applicants received an Office Communication dated July 20, 2006 alleging that the Amendment previously mailed was not responsive to the prior Office Action because of the following omission(s) or matters:

- (1) why new Claims 19-23 (classified in Class 585/323) meet the requirement of the original restriction (Claims 1-18) and
- (2) new claims are patentable over the prior art.

A copy of the Office Communication is appended hereto in Exhibit 2.

Applicants responded to the Official Communication on August 2, 2006 arguing that the Amendment was fully responsive. Applicants cited MPEP § 821.03 to the effect that even if the claims were directed to an invention distinct and independent of an invention previously claimed, a complete action on all of the claims to the elected invention should be given. Therefore, Applicants should not be required to cancel any claims prior to entry of the Amendment.

On October 18, 2006 a final Office Action was issued stating as follows:

Election/Restrictions

Newly submitted claims 19-23 directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: the newly added claims are directed to a combination process with extra steps which are not required in the original claims

Since Applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 19-23 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

37 CFR 1.145 provides as follows:

If, after an office action on an application, the applicant presents claims directed to an invention distinct from and independent of the invention previously claimed, the applicant will be required to restrict the claims to the invention previously claimed if the amendment is entered, subject to reconsideration and review as provided in §§ 1.143 and 1.144.

In accordance therewith Applicants herein present this petition for review.

Pursuant to MPEP § 808 reasons must be given for insisting upon a restriction.

The Official Communication of July 20, 2006 was not indicated to be a restriction requirement allowing rebuttal by Applicants. Rather, it simply demanded cancellation of the claims before the Amendment would even be considered. Applicants addressed the issue of the improper refusal to consider the Amendment in the subsequent response of August 2, 2006.

The restriction requirement was set forth in the final Office Action. The reason given therein was that newly added claims are directed to a combination process with extra steps not required in the original claims. The Office Action explains that since Applicants have received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits.

Applicants request reconsideration and withdrawal of the restriction requirement on the following grounds.

The invention as encompassed by Claims 1-18 and 10-3 are so related that a restriction requirement is not warranted.

The essential difference in subject matter between Independent Claims 19 and 21 on the one hand and Claim 1 is the additional recitation of the acetylene removal in step (c) of Claims 19 and 21. All of the claims are directed to a process for the production of ethylbenzene. All of

the claims recite the providing of a dilute ethylene stream. Claims 1 and 19 substantially recite separation of a portion of the ethylene containing stream for sending to an ethylene fraction and another portion for sending to an alkylator. Claims 1 and 21 substantially recite drawing off a side stream from the ethylene fractionator for sending to an alkylator.

Pursuant to 35 U.S.C. § 121, restriction may be required if two or more independent and distinct inventions are claimed in one application. Pursuant to MPEP § 802.01 the term "independent" means there is no disclosed relationship between the two or more inventions claimed, that is, they are unconnected in design, operation and effect. As shown above, there is a substantial commonality between Claims 1, 19 and 21 in operation and effect. Accordingly, the claims are related and should not be subject to a restriction requirement.

According to the Office Communication of July 20, 2006, the new claims fall into Class 585/323. The Office Communication did not specify the class and subclass of the original Claims 1-18. However, the corresponding publication in this application (U.S. Publication No. 2005/0054888) discloses Class 585/449 for the original claims. According to the Class Definitions published by the U.S. Patent and Trademark Office, subclass 449 is directed to plural alkylation stages, which are not the subject of the claimed invention. Therefore, the subclass 449 is not the correct subclass for this invention. See, Exhibit 3 appended hereto, which includes two pages of printout from the online classification definitions of the U.S. Patent and Trademark Office covering class 585, subclasses 440 to 449. Note, however, that even if the claims had been correctly classified, the Examiner is directed by the class definition for class 585, subclass 449 to also search class 585, subclass 323.

Therefore, in order for the Examiner to perform a satisfactory search of Claims 1-18, the subject matter of Claims 19-23 would have to be covered. Subclass 323 is directed to subject under subclass 319 wherein the series of conversions includes an alkylation step wherein an acyclic material is condensed with an aromatic material. See, Exhibit 4 appended hereto which includes four pages of printout from the online classification definitions of the U.S. Patent and Trademark Office covering Class 585, subclasses 310 to 323. As can be seen, in searching subclass 323, the Examiner is directed to also search subclasses 446 and subsequent related subclasses.

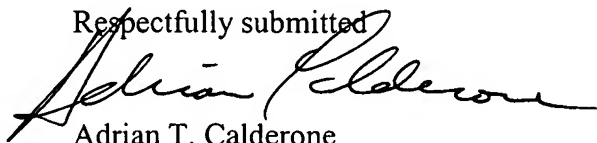
Therefore, the relatedness of Claims 1-18 and 19-23 is amply supported by the evidence.

Claims 19-23 are patentable over the cited prior art references for at least the reasons stated in Applicants' Amendment of May 9, 2006.

Accordingly, it is respectfully submitted that the restriction requirement is improper and should be withdrawn, the same being respectfully requested herein.

The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account No. 04-1121. A duplicate copy of this sheet is enclosed.

Respectfully submitted



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List of pending claims in US Application No: 10/660,065:

1. In a process for the production of ethylbenzene from a dilute ethylene stream wherein an ethylene-containing stream derived from the cracking of a hydrocarbon feed is directed to an ethylene fractionator for separation of ethylene and ethane, an improvement comprising:

- a) providing the dilute ethylene stream by
 - i. liquefying and separating out a portion of the ethylene-containing stream prior to directing the remainder of the ethylene-containing stream to the ethylene fractionator, and/or by
 - ii. drawing off a side stream from the ethylene fractionator; and,
- b) directing said dilute ethylene stream as a feed to an alkylator for alkylation with benzene to produce ethylbenzene-containing effluent.

2. The process of Claim 1 wherein said cracking of a hydrocarbon feed is a thermal cracking process.

3. The process of Claim 2 wherein the hydrocarbon feed is selected from the group consisting of ethane, propane, butane, naphtha, gas oil, hydrocracked vacuum gas oil and combinations thereof.

4. The process of Claim 2 wherein the hydrocarbon feed is ethane or naphtha.

5. The process of Claim 1 wherein the dilute ethylene stream has an ethylene content of from about 60 mol% to about 85 mol%.

6. The process of Claim 1 wherein the dilute ethylene stream is provided by first separating out the portion of the ethylene-containing stream and then substantially totally condensing said separated portion to produce a liquefied dilute ethylene stream for use as the alkylator feed.

7. The process of Claim 6 wherein the dilute ethylene stream has an ethylene content of from about 80 mol% to about 83 mol%.

8. The process of Claim 1 wherein the dilute ethylene stream is provided by cooling the ethylene-containing stream sufficiently to partially condense the ethylene stream to provide a liquefied dilute ethylene stream for use as the alkylator feed and an uncondensed remaining portion of the ethylene-containing stream which is then directed to the ethylene fractionator as a vapor.

9. The process of Claim 8 wherein the dilute ethylene stream has an ethylene content of from about 72 mol% to about 78 mol%.

10. The process of Claim 1 wherein the dilute ethylene stream is provided as a liquid or vapor side draw from a stripping section of the ethylene fractionator.

11. The process of Claim 10 wherein the dilute ethylene stream has an ethylene content of from about 60 mol% to about 65 mol%.

12. The process of Claim 1 wherein the dilute ethylene stream is provided as a liquid or vapor side draw from a rectification section of the ethylene fractionator.

13. The process of Claim 12 wherein the dilute ethylene stream has an ethylene content of from about 82 mol% to about 85 mol%.

14. The process of Claim 1 wherein the ethane separated by the ethylene fractionator is recycled to a cracking zone.

15. The process of Claim 1 further comprising fractionating the ethylbenzene-containing effluent from the alkylator in a first fractionator to provide an overhead stream containing unconverted benzene and a bottom stream containing ethylbenzene.

16. The process of Claim 15 comprising recycling at least a portion of the overhead stream from the first fractionator to the alkylator.

17. The process of Claim 16 further comprising fractionating the bottom stream of the first fractionator in a second fractionator to provide an ethylbenzene overhead and a bottom stream containing polyethylbenzene.

18. The process of Claim 17 wherein the bottom stream of the second alkylator is fractionated in a third fractionator to provide a polyethylbenzene-containing overhead stream, and recycling the polyethylbenzene-containing overhead stream to a transalkylator for transalkylation with a portion of the unconverted benzene recycled from the first fractionator.

19. A process for the production of ethylbenzene comprising the steps of:
a) cracking a hydrocarbon to provide an olefin-containing effluent;
b) separating out a C₂ component stream from the olefin-containing effluent;
c) removing acetylene from the C₂ component stream to provide a dilute ethylene stream containing ethylene and ethane;
d) separating the dilute ethylene stream into a first portion to be sent to an alkylator and a second portion to be fed to an ethylene fractionator to separate the ethylene and ethane components of the second portion;
e) condensing the alkylator feed to provide an alkylator feed stream; and
f) directing the alkylator feed stream to the alkylator for reaction with benzene to provide an ethylbenzene product.

20. The process of Claim 17 wherein the separating step (b) is performed by distillation.

21. A process for the production of ethylbenzene comprising the steps of:
a) cracking a hydrocarbon to provide an olefin-containing effluent;
b) separating out a C₂ component stream from the olefin-containing effluent;

- c) removing acetylene from the C₂ component stream to provide a first dilute ethylene stream containing ethylene and ethane;
- d) feeding the dilute ethylene stream to an ethylene fractionator to separate the ethylene and ethane components of the second portion;
- e) drawing off a side stream from the ethylene fractionator to provide an alkylator feed stream; and
- f) directing the alkylator feed stream to the alkylator for reaction with benzene to provide an ethylbenzene product.

22. The process of Claim 21 wherein the side stream is withdrawn at a point below the feed point to provide an alkylator feed having an ethylene content less than that of the dilute ethylene stream fed to the ethylene fractionator.

23. The process of Claim 21 wherein the side stream is withdrawn at a point above the feed point to provide an alkylator feed having an ethylene content higher than that of the dilute ethylene stream fed to the ethylene fractionator.

**UNITED STATES DEPARTMENT OF COMMERCE****U.S. Patent and Trademark Office**

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10/660 065

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
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EXAMINER

ART UNIT	PAPER
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20060714

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

The reply filed on 5/11/2006 is not fully responsive to the prior Office Action because of the following omission(s) or matter(s): (1) why new claims 19-23 (classified in class 585/323) meet the requirement of the original restriction (claims 1-18) in the previous Office action and (2) new claims are patentable over the prior arts. See 37 CFR 1.111. Since the above-mentioned reply appears to be bona fide, applicant is given ONE (1) MONTH or THIRTY (30) DAYS from the mailing date of this notice, whichever is longer, within which to supply the omission or correction in order to avoid abandonment. EXTENSIONS OF THIS TIME PERIOD MAY BE GRANTED UNDER 37 CFR 1.136(a).


Thuan D. Dang
Primary Examiner
Art Unit: 1764

440 By dehydrogenation:

This subclass is indented under subclass 435. Subject matter in which hydrogen atoms are removed from a feedstock compound to produce the product.

SEE OR SEARCH THIS CLASS, SUBCLASS:

257, for a hydrogen-exchange disproportionation process in which the hydrocarbon which becomes more saturated is a desired product of the process.

¶ 441 Plural stage or with plural separation procedures:

This subclass is indented under subclass 440. Subject matter wherein the effluent from a dehydrogenation reaction is sent to another dehydrogenation reaction or in which two or more separation steps are performed.

(1) Note. One or more of the separation steps may be preliminary to the reaction.

(2) Note. Frequently a compound separated from the effluent is recycled.

SEE OR SEARCH THIS CLASS, SUBCLASS:

800+, and the notes thereto for separation procedures, per se, applied to hydrocarbon materials.

¶ 442 Using halogen or S:

This subclass is indented under subclass 440. Subject matter in which elemental or combined halogen or sulfur is added to the reaction mixture.

(1) Note. Often hydrogen from the compound which become the desired product chemically combines with a component of the halogen or sulfur compound.

¶ 443 Using elemental O:

This subclass is indented under subclass 440. Subject matter in which elemental oxygen, e.g., air, is added to the reaction mixture.

(1) Note. Usually hydrogen from the compound which becomes the desired product chemically combines with the elemental oxygen.

(2) Note. Processes described as "partial combustion" are placed here.

¶ 444 Using metal oxide, sulfide, or salt:

This subclass is indented under subclass 440. Subject matter wherein part or all of the synthesis takes place in the presence of an oxide, sulfide, or salt of a metal.

¶ 445 Cr-, Mo-, or W-containing:

This subclass is indented under subclass 444. Subject matter wherein the process uses chromium, tungsten, or molybdenum in free or combined form.

¶ 446 By condensation of entire molecules or entire hydrocarbyl moieties thereof, e.g., alkylation, etc.:

This subclass is indented under subclass 400. Subject matter wherein there is added to an aromatic hydrocarbon, or that moiety of an aromatic nonhydrocarbon which remains after atoms other than carbon and hydrogen have been removed, an acyclic straight or branched hydrocarbon molecule or that moiety of an acyclic nonhydrocarbon which remains after atoms other than carbon and hydrogen have been removed.

(1) Note. The ring compound onto which the chain is introduced may already include one or more side-chains, e.g., toluene, xylene, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

470+, for a process in which a hydrocarbyl moiety which is only a part of a hydrocarbon molecule is added to an aromatic molecule.

709+, for alkylation of an olefin to produce a noncyclic hydrocarbon.

447 With specified flow rate through reactor or flow procedure within or at entrance to reactor:

This subclass is indented under subclass 446. Subject matter wherein a procedure for achieving contact and/or confluence of materials in the reactor or at the entrance to the reactor is specified, or in which the time which a reactant takes to flow through the reactor is specified.

SEE OR SEARCH THIS CLASS, SUBCLASS:

922+, for a collection of patents drawn to other hydrocarbon conversion processes wherein a reactor fluid manipulating device is specified.

955+, for a collection of patents drawn to other hydrocarbon synthesis processes in which a mixing procedure is specified.

448 With preliminary treatment of feed:

This subclass is indented under subclass 446. Subject matter wherein the hydrocarbon feed is treated prior to the alkylation reaction, e.g., by separating nonhydrocarbons therefrom, by separating the feed into several different fractions, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

323, for a process wherein an intermediate is formed in an aromatic synthesis process which includes an alkylation step.

449 Plural alkylation stages:

This subclass is indented under subclass 446. Subject matter in which the effluent from an aromatic alkylation reaction is sent to another aromatic alkylation reaction.

SEE OR SEARCH THIS CLASS, SUBCLASS:

300+, for a process wherein two or more alkylation reactions are conducted in parallel.

323, for a process in which an aromatic alkylation reaction is preceded or followed by a conversion other than aromatic alkylation.

310 PLURAL SERIAL DIVERSE SYNTHESSES:

This subclass is indented under the class definition. Subject matter in which a feedstock is subjected to chemical conversion to form an intermediate and in a separate subsequent step the intermediate is converted to a desired hydrocarbon product or to another intermediate, etc., each conversion involving a diverse synthesis type.

(1) Note. A series of syntheses is considered to be diverse when either (a) each synthesis produces a different type of product or (b) each synthesis is a different type of reaction.

(2) Note. The following are considered to be different types of product: (a) A nonhydrocarbon. (b) An alicyclic hydrocarbon (naphthene, terpene) (c) An aromatic hydrocarbon (including aralkyl compounds) (d) An unsaturated hydrocarbon (olefin, diolefin, alkyne) (e) A saturated hydrocarbon (paraffin, isoparaffin)

(3) Note. The following are considered to be different types of reactions. The subclasses of this class concerned with such type reaction, per se, may be found in the Search this Class, Subclass Notes below:

- (a) Condensation of entire hydrocarbon molecules (polymerization, alkylation;
- (b) Alkyl transfer
- (c) Skeletal isomerization;
- (d) Shift of double bond;
- (e) Removal of nonhydrocarbon element;
- (f) Carbon content reduction;
- (g) Dehydrogenation

(4) Note. Except for patents claiming process steps specifically provided for in subclasses 311-316, patents are placed in this and its indented subclasses on the basis of the ultimate product of an entire claimed plural serial diverse synthesis process; the patent placed as an original in the first appearing subclass which provides for such ultimate product and is cross-referenced to: a. Other of these subclasses appropriate for other ultimate or intermediate products produced by two or more diverse synthesis steps and b. to every subclass which provides for a synthesis step which is more than nominally included in any claim. A nominal recitation is a mere mention of a step, e.g., "dehydrogenation".

(5) Note. A process in which a single synthesis step is followed by a reaction which merely converts a by-product of the synthesis to material identical with the feedstock is not considered to be plural syntheses. See subclasses 905.

(6) Note. The occurrence of several phenomena simultaneously in a single step, e.g., alkylation and isomerization, etc., does not call for classification here (subclasses 310+). Rather, a patent claiming such a process step is classified in the first appearing subclass concerned with either phenomenon and crossed to the subclass dealing with the other.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 251+**, and 254+, for a plural serial diverse synthesis process in which one step is hydrogenation.
- 353+**, 439, 476, 483+, 539, 613+, 648+, 752, for Carbon content reduction. (see (3) Note above)
- 353+**, 358, 365+, 371+, 404+, 476, 477+, 671, 734+, for Skeletal isomerization. (see (3) Note above)
- 357+**, 436+, 469+, 603+, 637, 638+, 711, 733, for Removal of nonhydrocarbon element. (see (3) Note above)

- 361+**, 364, 375+, 406, 415+, 422+, 438, 446+, 502+, 709+, for Condensation of entire hydrocarbon molecules (polymerization, alkylation. (see (3) Note above)
- 363**, 377+, 664+, for Shift of double bond. (see (3) Note above)
- 375+**, 470+, 643+, 708, for Alkyl transfer. (see (3) Note above)
- 379+**, 430+, 440+, 540+ 616+, 654+, for Dehydrogenation. (see (3) Note above)
- 930+**, for a collection of patents drawn to processes which involve synthesis of a nonhydrocarbon intermediate.

- 311 One synthesis rehabilitates catalyst for other, e.g., by alkylation with ester, etc.:**
This subclass is indented under subclass 310. Subject matter in which a catalyst which has deteriorated in its effectiveness in a synthesis process is treated to restore its effectiveness by using it in another hydrocarbon synthesis.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 301**, and 702+, for a process in which a catalyst is used in plural distinct treatments, its use in one treatment sometimes serving, incidentally, to improve its effectiveness in the other treatment.
- 328**, for a process in which a nonhydrocarbon material, e.g., aluminum trialkyl, reacts in a "growth" reaction with an olefin to form a higher alkyl nonhydrocarbon, and the alkyl is replaced by a lower carbon-content hydrocarbon leaving the original nonhydrocarbon reactant.

- 312 Same catalyst, solvent, or component thereof used in both syntheses:**
This subclass is indented under subclass 310. Subject matter wherein a catalyst, solvent, diluent, or a material which makes up part of such substance is used in both of the syntheses.
- (1) Note. Use of different portions of an extraneous material in both syntheses is not sufficient for placement of a patent in this subclass.
 - (2) Note. Where both syntheses use an extraneous agent drawn from and returned to a common pool or reservoir, the patent is placed here.
 - (3) Note. Use of a material as a catalyst in one reaction and as a reactant in a second reaction, e.g., use of HF catalyst from one reaction to form alkyl fluoride in another, does not provide a basis for classification in this subclass.

- 313 Entire catalyst composition:**
This subclass is indented under subclass 312. Subject matter wherein the extraneous material employed in both syntheses includes all of the catalytic material used in each synthesis in the same proportions relative to each other.

- 314 With hydrocarbon effluent stream splitting for recycle to different syntheses:**
This subclass is indented under subclass 310. Subject matter wherein the effluent from a single reaction is split and portions of the effluent are sent to different ones of the serial syntheses.

- 315 With hydrocarbon recycle from later to earlier synthesis:**
This subclass is indented under subclass 310. Subject matter in which hydrocarbon material effluent from one synthesis is passed to a diverse synthesis through which diverse synthesis zone the hydrocarbon or its precursor has passed before.

- 316 Earlier synthesis is condensation or alkyl transfer:**

This subclass is indented under subclass 315. Subject matter wherein the earlier synthesis is a condensation reaction, that is, polymerization, alkylation, etc., or an alkyl transfer

(disproportionation) reaction.

SEE OR SEARCH THIS CLASS, SUBCLASS:

361+, 364, 406, 415+, 422+, 438, 446+, 502+, and 709+, for condensation reactions, per se.

375+, 470+, 643+, and 708, for alkyl transfer reactions, per se.

317 To produce alicyclic:

This subclass is indented under subclass 310. Subject matter wherein the ultimate product or an intermediate product, produced by at least two diverse conversions, is a nonaromatic cyclic material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

350+, for the production of alicyclic compounds by a single synthesis step or a process performing similar syntheses in plural serial stages.

318 Having unsaturated ring:

This subclass is indented under subclass 317. Subject matter wherein the product has olefinic unsaturation in a ring.

319 To produce aromatic:

This subclass is indented under subclass 310. Subject matter in which the ultimate product or an intermediate product, produced by at least two diverse conversions, is an aromatic.

SEE OR SEARCH THIS CLASS, SUBCLASS:

400+, for the production of an aromatic compound by a single synthesis step or by a process performing similar syntheses in plural serial stages.

320 Polycyclic:

This subclass is indented under subclass 319. Subject matter which the product has more than one ring.

(1) Note. One or more of the rings may be alicyclic, but if the product contains one or more aromatic rings, the patent is proper for this subclass.

321 Having plural side-chains:

This subclass is indented under subclass 319. Subject matter wherein the product is an aromatic hydrocarbon having two or more hydrocarbyl substituents on the aromatic ring.

(1) Note. Any or all of the side-chains may be saturated (alkyl), unsaturated (alkenyl, alkylidene), etc.

322 Including an aromatization step:

This subclass is indented under subclass 319. Subject matter wherein a step converts a nonaromatic moiety to an aromatic moiety, e.g., by dehydrogenation of an alicyclic moiety, ring formation from an open-chain moiety, etc.

323 Including an alkylation step:

This subclass is indented under subclass 319. Subject matter wherein the series of conversions includes an alkylation step wherein an acyclic material is condensed with an aromatic material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

446+, for alkylation of aromatics, per se.